

(20) 1000 Kg mineral, 75% $\text{Fe}_2\text{O}_3 \rightarrow 750 \text{ Kg } \text{Fe}_2\text{O}_3$.



• Cantidad de Fe que teóricamente se obtendría del mineral.

Por estequiometría: 1 mol $\text{Fe}_2\text{O}_3 \rightarrow 2 \text{ mol Fe}$.

$$750.000 \text{ g } \text{Fe}_2\text{O}_3 \cdot \frac{2.558 \text{ g Fe}}{159.6 \text{ g } \text{Fe}_2\text{O}_3} = 524.000 \text{ g Fe}$$

• Cantidad de Fe real que se obtiene \Rightarrow

$$95\% \text{ de } 524 \text{ Kg} = 497.8 \text{ Kg de Fe}$$

$$\text{Rendimiento: } \frac{497.8 \text{ Kg Fe}}{524 \text{ Kg Fe}} \cdot 100 = 95\%$$

(21) $2 \text{ NH}_4\text{Cl} + \text{CaO} \rightarrow \text{CaCl}_2 + 2 \text{ NH}_3 + \text{H}_2\text{O}$

• Cantidad de NH_3 que puede obtenerse (teórica) a partir de $107 \text{ g } \text{NH}_4\text{Cl}$

Por estequiometría:

$$107 \text{ g } \text{NH}_4\text{Cl} \cdot \frac{1 \text{ mol } \text{NH}_4\text{Cl}}{53.5 \text{ g } \text{NH}_4\text{Cl}} \cdot \frac{2 \text{ mol } \text{NH}_3}{2 \text{ mol } \text{NH}_4\text{Cl}} = 0.2 \text{ mols } \text{NH}_3$$

• Cantidad de NH_3 real obtenida: $4.032 \text{ mols } \cdot \frac{1 \text{ mol}}{22.4 \text{ L}} = 0.18 \text{ mols } \text{NH}_3$

$$\text{Rendimiento: } \frac{0.18}{0.2} \cdot 100 = 90\%$$

(22) $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$

• Se parte de 0.11 Kg de mineral al 75% de $\text{CaCO}_3 \Rightarrow 75 \text{ g } \text{CaCO}_3$

• Se obtiene (real) $9 \text{ L } \text{CO}_2$.

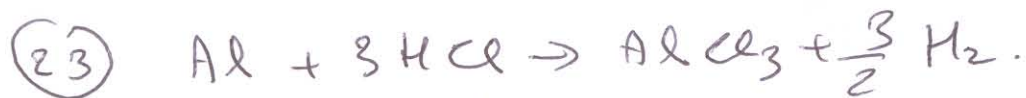
• Cantidad de CO_2 que podría obtenerse (teórica) a partir

de los $75 \text{ g } \text{CaCO}_3$:

$$75 \text{ g } \text{CaCO}_3 \cdot \frac{1 \text{ mol } \text{CaCO}_3}{100 \text{ g } \text{CaCO}_3} \cdot \frac{1 \text{ mol } \text{CO}_2}{1 \text{ mol } \text{CaCO}_3} = 0.75 \text{ mols } (\text{O}_2 \Rightarrow)$$

$$\Rightarrow 16.8 \text{ L } \text{CO}_2 \text{ en C.M.}$$

$$\text{Rendimiento: } \frac{9 \text{ L}}{16.8 \text{ L}} \cdot 100 = 53.6\%$$



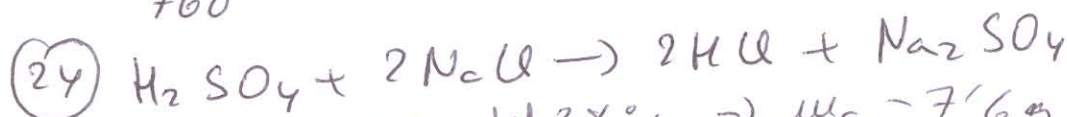
Dato: 100g muestra del 81% de Al \Rightarrow 81g Al.

a) $81\text{g Al} \times \frac{1\text{ mol Al}}{27\text{g Al}} \times \frac{3\text{ mol HCl}}{1\text{ mol Al}} = 9\text{ moles HCl (soluto)}.$

$V_0 \Rightarrow S_k = \frac{9\text{ moles HCl}}{V_0}; V_0 = 1'8\text{ L}$

b) $3\text{ moles Al} \times \frac{\frac{3}{2}\text{ mol H}_2}{1\text{ mol Al}} = 4'5\text{ moles H}_2.$
estequiometría

$\frac{740}{760} \cdot V = 4'5 \cdot 0'082 \cdot 300; V = 113'72\text{ H}_2.$



Dato: $m_D = 20\text{g}$ del 38% $\Rightarrow m_s = 7'6\text{g HCl}$

$7'6\text{g HCl} \times \frac{1\text{ mol HCl}}{36'5\text{g HCl}} \times \frac{1\text{ mol H}_2\text{SO}_4}{2\text{ mol HCl}} = 0'104\text{ moles H}_2\text{SO}_4 \Rightarrow$

$m_{\text{H}_2\text{SO}_4} = 10'2\text{g H}_2\text{SO}_4 \text{ (soluto)}.$

$m_D \Rightarrow 10'2\text{g H}_2\text{SO}_4 \cdot \frac{100\text{g D}}{90\text{g soluto}} = 11'34\text{g D}.$

(25) $\text{Cu, Pb, Zn} \} 1'528\text{g} \left\{ \begin{array}{l} m_{\text{PbSO}_4} = 0'0120\text{g} \\ m_{\text{Zn}_2\text{P}_2\text{O}_7} = 0'2206\text{g} \end{array} \right.$

• max de Pb contenida en el $\text{PbSO}_4 \Rightarrow$

$0'0120\text{g PbSO}_4 \cdot \frac{207\text{g Pb}}{303\text{g PbSO}_4} = 8'19 \cdot 10^{-3}\text{g Pb} \Rightarrow \frac{8'19 \cdot 10^{-3}\text{g Pb} \cdot 100}{1'528\text{g total}} = 0'54\%$

• $\text{Zn} // : 0'2206\text{g Zn}_2\text{P}_2\text{O}_7 \times \frac{130'6\text{g Zn}}{304'6\text{g Zn}_2\text{P}_2\text{O}_7} = 0'09\text{g Zn}$

$\frac{0'09\text{g Zn}}{1'528\text{g muestra}} \cdot 100 = 6'2\% \text{ de Zn}$

• $\text{Cu} \Rightarrow 100 - (0'54 + 6'2) = 93'26\% \text{ Cu}.$



a) Cantidad de N_2 real obtenida = $42'02\text{g}$

$\frac{42'02\text{g N}_2}{\text{max teórica de N}_2} = \frac{85}{100}; \text{max de N}_2 \text{ teórica} = 49'43\text{g N}_2$

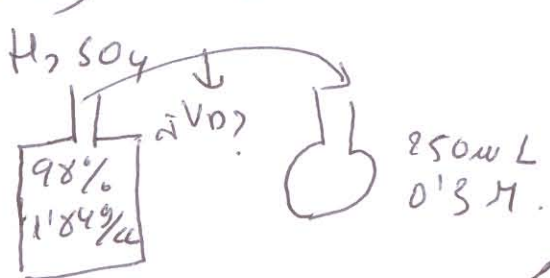
cantidad de NaM_3 necesaria (teórica):

$$44'43 \text{ g N}_2 \times \frac{1 \text{ mol N}_2}{28 \text{ g N}_2} \times \frac{1 \text{ mol NaM}_3}{\frac{3}{2} \text{ mol N}_2} \times \frac{65 \text{ g NaM}_3}{1 \text{ mol NaM}_3} = 76'5 \text{ g NaM}_3$$

b) $\text{N} \Rightarrow \frac{14'3 \text{ g N}}{65 \text{ g NaM}_3} = \frac{x}{100} \Rightarrow x = 64'6\% \text{ N}$

$\text{Na} \Rightarrow 35'4\%$

(27) a) Problema de Dilución (repro).



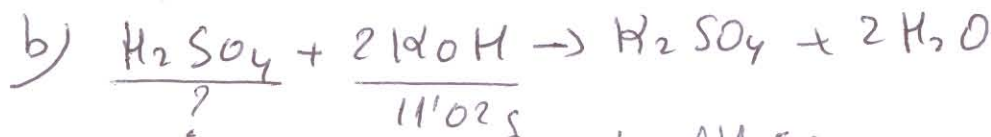
M_s necesarios $\Rightarrow 0'3 \cdot 0'25 = 0'075 \text{ moles}$

$\Rightarrow 7'35 \text{ g H}_2\text{SO}_4$ que debemos

tomar de la Dilución concentrada:

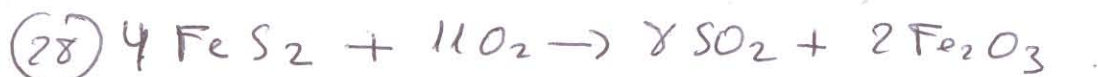
$$\frac{7'35 \text{ g S}}{x \text{ g D}} = \frac{98 \text{ g S}}{100 \text{ g D}} \Rightarrow 7'5 \text{ g D} \Rightarrow$$

$\Rightarrow V_D \Rightarrow 11'84 \frac{\text{g}}{\text{cm}^3} = \frac{7'5 \text{ g}}{V_D}; V_D = 4'07 \text{ cc}$



$11'02 \text{ g KOH} \times \frac{1 \text{ mol}}{56 \text{ g KOH}} \times \frac{1 \text{ mol H}_2\text{SO}_4}{2 \text{ mol KOH}} = 0'1 \text{ mol H}_2\text{SO}_4$ que tomamos de la Dilución $0'3 \text{ M}$.

$0'3 = \frac{0'1}{V_D}; V_D = 0'333 \text{ L} = 333 \text{ cm}^3$



a) $2000 \text{ kg del } 90\% = 1800 \text{ kg FeS}_2$

$1'8 \cdot 10^6 \text{ g FeS}_2 \times \frac{1 \text{ mol FeS}_2}{119'8 \text{ g FeS}_2} \times \frac{8 \text{ mol SO}_2}{4 \text{ mol FeS}_2} = 30'050 \text{ moles SO}_2 \Rightarrow$

$\Rightarrow 19'232 \text{ kg SO}_2 = 19 \text{ T de SO}_2$

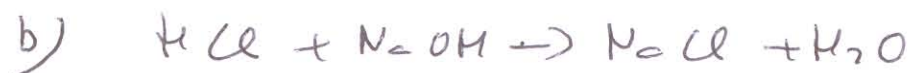
b) $30'050 \text{ mol SO}_2 \times \frac{11 \text{ moles O}_2}{8 \text{ mol SO}_2} = 41'300 \text{ moles O}_2$

$V_{O_2} \Rightarrow 1 \cdot V = 41300 \cdot 0'082 \cdot 298'15; V_{O_2} = 1009'714 \text{ L O}_2$

$\frac{21 \text{ L O}_2}{100 \text{ L aire}} = \frac{1009'714}{x}; V_{\text{aire}} = 4'8 \cdot 10^6 \text{ L}$

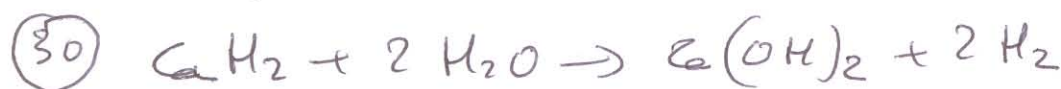
(29) a) Reparo Divalentes.

$$\left. \begin{array}{l} m_s = 180 \text{ g NaOH} \\ m_d = 400 \text{ g H}_2\text{O} \\ d = 1184 \text{ g/cm}^3 \end{array} \right\} \begin{array}{l} m_D = 580 \text{ g} \Rightarrow V_D = 432'8 \text{ cm}^3 \\ M = \frac{\frac{180 \text{ g}}{40 \text{ g/mol}}}{0'432 \text{ L}} = 10'4 \text{ M} \end{array}$$

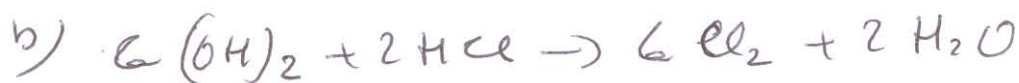


1 L, 10'4 M NaOH \Rightarrow 10'4 mols NaOH.

Por estequiometria \Rightarrow 10'4 mols HCl \Rightarrow 379 g HCl.

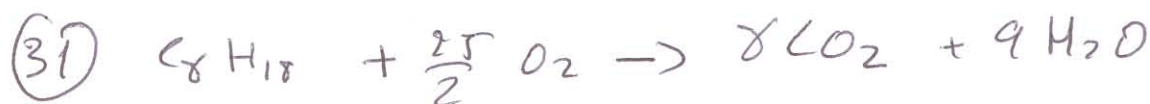


a) $5 \text{ L H}_2 \times \frac{1 \text{ mol}}{22'4 \text{ L}} \times \frac{1 \text{ mol C}_6\text{H}_2}{2 \text{ mol H}_2} = 0'1116 \text{ mol C}_6\text{H}_2 \Rightarrow \underline{4'69 \text{ g C}_6\text{H}_2}$



$0'1116 \text{ mol C}_6\text{H}_2 \times \frac{1 \text{ mol C}_6(\text{OH})_2}{1 \text{ mol C}_6\text{H}_2} \times \frac{2 \text{ mol HCl}}{1 \text{ mol C}_6(\text{OH})_2} = 0'2232 \text{ mol HCl}$

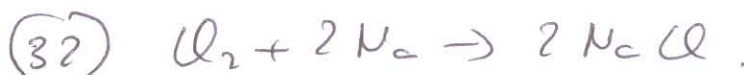
$V_D \Rightarrow 0'5 \text{ M} = \frac{0'2232 \text{ mol HCl}}{V_D}; V_D = 0'446 \text{ L} = \underline{446 \text{ mL}}$



2'5 L C_8H_{18} , $d = 0'703 \text{ Kg/L} \Rightarrow m = 1'7575 \text{ Kg C}_8\text{H}_{18}$

$1757'5 \text{ g C}_8\text{H}_{18} \times \frac{1 \text{ mol C}_8\text{H}_{18}}{114 \text{ g C}_8\text{H}_{18}} \times \frac{\frac{25}{2} \text{ mol O}_2}{1 \text{ mol C}_8\text{H}_{18}} = 193'48 \text{ mol O}_2$

$V_{\text{O}_2} = 4316'7 \text{ L O}_2 \Rightarrow \frac{21 \text{ L O}_2}{100 \text{ L ar}} = \frac{4316'7}{x}; \underline{V_{\text{ar}} = 20.638 \text{ L}}$



$\text{Cl}_2 \rightarrow 0'19776 \text{ mols}$
 $\text{Na} \rightarrow 0'15 \text{ mols}$
 Na é o reactivo limitante, logo
 mols Na \leq mols Cl_2 necessitas mais Cl_2 .

a) Reactivo em excesso: Cl_2

$0'15 \text{ mols Na} \times \frac{1 \text{ mol Cl}_2}{2 \text{ mol Na}} = 0'075 \text{ mol Cl}_2 \text{ reacciona}$

Sobra: $0'19776 - 0'075 = \underline{0'123 \text{ mols de Cl}_2 \text{ sobra}}$

$$b) 0'15 \text{ mol Na} \times \frac{2 \text{ mol NaCl}}{2 \text{ mol Na}} = 0'15 \text{ mol NaCl} \Rightarrow 8'775 \text{ g NaCl}$$



$$500 \text{ mL}, 25\%, d = 1'09 \text{ g/cm}^3 \Rightarrow$$

$$m_D = 545 \text{ g} \Rightarrow m_S = 136'25 \text{ g} \Rightarrow 1'39 \text{ mols H}_2\text{SO}_4$$

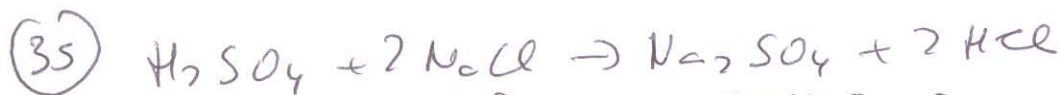
$$a) \text{ Por estequiometría } \Rightarrow 1'39 \text{ mol Zn} \Rightarrow 90'92 \text{ g Zn}$$

$$\Rightarrow 1'39 \text{ mol H}_2 \Rightarrow V_{\text{H}_2}(\text{CN}) = 31'136 \text{ L H}_2$$

$$b) \text{ " " "}$$

$$(34) \left. \begin{array}{l} 2'0 \text{ g H}_2 \Rightarrow 1 \text{ mol H}_2 \\ 8'4 \text{ g N}_2 \Rightarrow 0'3 \text{ mol N}_2 \\ 4'8 \text{ g CH}_4 \Rightarrow 0'3 \text{ mol CH}_4 \end{array} \right\} \begin{array}{l} P_{\text{H}_2} = \frac{1 \cdot 0'082 \cdot 373}{10} = 3'06 \text{ atm} \\ P_{\text{N}_2} = 0'918 \text{ atm} \\ P_{\text{CH}_4} = 0'918 \text{ atm} \\ \hline P_T = 4'896 \text{ atm} \end{array}$$

$$b) \frac{P}{T} = \frac{P'}{T'} \Rightarrow \frac{4'896}{373} = \frac{P'}{448} ; P' = 5'89 \text{ atm}$$



$$\left. \begin{array}{l} \text{H}_2\text{SO}_4 \left\{ \begin{array}{l} 50 \text{ mL} \\ 98\% \\ 1'835 \text{ g/cm}^3 \end{array} \right\} \begin{array}{l} m_D = 91'75 \text{ g D} \\ m_S = 89'9 \text{ g soluto} \Rightarrow 0'92 \text{ mols H}_2\text{SO}_4 \end{array} \end{array} \right\}$$

$$\text{NaCl} \Rightarrow 87 \text{ g} \Rightarrow 1'5 \text{ mols} = \frac{87 \text{ g}}{58'5 \text{ g/mol}} = 1'5 \text{ mols NaCl}$$

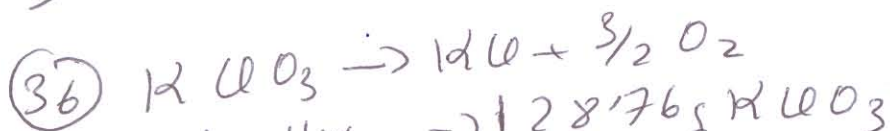
$$a) \text{ Reactivo limitante NaCl}$$

$$\text{exceso H}_2\text{SO}_4$$

$$1'5 \text{ mols NaCl} \times \frac{1 \text{ mol H}_2\text{SO}_4}{2 \text{ mol NaCl}} = 0'75 \text{ mols H}_2\text{SO}_4 \text{ reaccionan} \Rightarrow$$

$$\text{Solman } 0'92 - 0'75 = 0'17 \text{ mols H}_2\text{SO}_4$$

$$b) \text{ Por estequiometría } \Rightarrow \text{ Se tienen } 0'75 \text{ mol Na}_2\text{SO}_4 \Rightarrow 106'5 \text{ g Na}_2\text{SO}_4$$



$$87\% \text{ de } 148 \text{ g} \Rightarrow 128'76 \text{ g KClO}_3$$

$$128'76 \text{ g KClO}_3 \cdot \frac{1 \text{ mol KClO}_3}{122'5 \text{ g KClO}_3} \times \frac{3/2 \text{ mol O}_2}{1 \text{ mol KClO}_3} = 1'577 \text{ mols O}_2 \Rightarrow$$

$$V = \frac{1'577 \cdot 0'082 \cdot 398}{1} = 51'47 \text{ L}$$

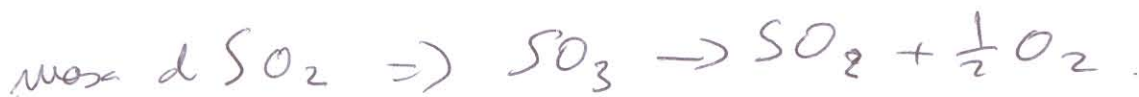
$$\begin{array}{l} \text{moléculas de O}_2: \\ 1'577 \cdot N_A = 9'4 \cdot 10^{23} \\ \hline \text{moléculas de O}_2 \end{array}$$

(37) SO_3 ; 158g SO_3

$$n^\circ \text{ mols } \text{SO}_3 = \frac{158\text{g}}{80 \frac{\text{g}}{\text{mol}}} = 1'975 \text{ mols}$$

$$P = \frac{1'975 \cdot 0'082 \cdot 298}{10} = 4'8 \text{ atm}$$

$$n^\circ \text{O}_2 = n^\circ \text{ mols } \text{SO}_3 = 1'975 \text{ mols} \Rightarrow 1'975 \cdot N_A = 1'19 \cdot 10^{24} \text{ molecules}$$



Per a tequimètrica $\Rightarrow n^\circ \text{SO}_3 = n^\circ \text{SO}_2 = 1'975 \text{ mols}$

$$1'975 \text{ mols } \text{SO}_2 \times \frac{64\text{g}}{1 \text{ mol}} = 126'4 \text{g } \text{SO}_2 \text{ teòric}$$

$$\frac{\delta \text{ g real}}{100\text{g teòric}} = \frac{x}{126'4\text{g}} \Rightarrow x = 107'47\text{g } \text{SO}_2 \text{ real}$$



50 T 85% $\Rightarrow 42'5 \cdot 10^6 \text{g } \text{C} \text{CO}_3 = 42'5 \text{ T } \text{C} \text{CO}_3$

$$42'5 \cdot 10^6 \text{g de } \text{C} \text{CO}_3 \times \frac{56\text{g } \text{CO}}{100\text{g } \text{C} \text{CO}_3} = 23'8 \cdot 10^6 \text{g } \text{CO} = 23'8 \text{ T } \text{CO}$$

$$23'8 \text{ T teòric} \times \frac{95 \text{ real}}{100 \text{ Teòric}} = \underline{\underline{22'6 \text{ T } \text{CO real}}}$$